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MOTOR AND ATTACHMENT STRUCTURE

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims benefit under 35 U.S.C. § 120 of U.S. Application Serial No. 09/734,703, filed December 13, 2000, and entitled "Motor and Attachment Structure", now U.S. Patent No. 6,798,100, ~~and of U.S. Application Serial No. 10/806,216, filed March 23, 2004, and entitled "Steering Device for Toy," now allowed, which claims benefit under 35 U.S.C. § 120 of U.S. Application Serial No. 10/056,090, filed January 28, 2002, entitled "Steering Device for Toy and Running Toy," now allowed, each of~~ which is hereby incorporated by reference in its entirety into this application.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] The present invention relates to a motor~~ for a running toy~~, an attachment structure for attaching the motor, in particular, to a structure of electrode terminals of the motor and an electric connection structure between the electrode terminals of the motor and a battery~~, and a running toy, such as a vehicle or the like, including the motor~~.

Description of Related Art

[0003] In general, a motor ~~for a running toy~~ having a pair of electrode terminals, i.e., positive and negative terminals, at the rear portion thereof is known. In order to incorporate such a motor, for example, in ~~the~~a toy or the like, it is required to solder one end of each corresponding conductive wire (lead wire) to the corresponding electrode terminal of the motor, respectively and to connect the other end of each corresponding conductive wire to each electrode of the battery.

[0004] However, the motor with such a structure of electrode terminals has a problem of being difficult to miniaturize it. That is, in order to miniaturize the motor, when making each component part thereof small, each of two electrode terminals becomes small also. Accordingly, it is not possible to secure the rigidity of the electrode terminals and it becomes hard to solder one end of each corresponding conductive wire to the corresponding electrode terminal because the distance between the electrode terminals is also small.

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SUMMARY OF THE INVENTION

[0005] An object of the invention is to provide a motor having a structure of electrode terminals which is suitable for miniaturization.

[0006] Another object of the invention is to provide an improved electric connection structure between the electrode terminals of the motor and a battery.

[0007] In accordance of one aspect of the invention, in the motor with a plurality of electrode terminals, at least a portion of a case for the motor forms at least one of the plurality of electrode terminals.

[0008] According to the motor, because at least a portion of a motor case which has a relatively large surface area among the component parts forms at least one of the electrode terminals (may form all electrode terminals), it is easy to solder one end of each corresponding conductive wire to the corresponding electrode terminal and it is possible to enhance the rigidity of the electrode terminals.

[0009] Even if the rest of the electrode terminals is disposed on the end surface of the motor, because at least one of the electrode terminals is provided on the case, the rest of the electrode terminals can be made thick in comparison with the case of providing all terminals on the end surface of the motor. As a result, it is possible to make the electric connection for the rest of the electrode terminals good and also to enhance the rigidity thereof.

[0010] Providing a plurality of electrode terminals on the peripheral surface of the case requires making a plurality of regions which are insulated to each other, on the case.

[0011] The motor may comprise two electrode terminals and a portion of the case for the motor may form at least one of the two electrode terminals.

[0012] According to such a motor, it is possible to provide almost the same function and advantageous effects as the above-described motor.

[0013] The motor may comprise two electrode terminals and at least a portion of the case for the motor may form two electrically separated regions, one of which forms one of the two electrode terminals and the other of which forms the other of the two electrode terminals.

[0014] According to the motor having such a structure, because at least a portion of a motor case which has a relatively large surface area among the component parts forms at least one of the electrode terminals, it is easy to electrically connect one end of each corresponding conductive wire to the corresponding electrode terminal and it is possible to enhance the rigidity of the electrode terminals.

[0015] The motor may comprise positive and negative electrode terminals and at least a portion of the case for the motor may form the negative electrode terminal. The motor may comprise positive and negative electrode terminals and at least a portion of the case for the motor may form the positive electrode terminal. In these cases, the negative electrode terminal or the positive electrode terminal provision formed on the case should be insulated from the other electrode.

[0016] The other electrode terminal may be disposed on an end surface of the motor.

[0017] According to the motor having such a structure, because only one electrode terminal is provided on the end surface of the motor, the electrode terminal on the end surface can be made thick in comparison with the case of providing two terminals on the end surface of the motor. As a result, it is possible to make the electric connection for the electrode terminal on the end surface good and also to enhance the rigidity thereof.

[0018] In accordance with another aspect of the invention, in the attachment structure for attaching a motor to a battery, each of the electrode terminals of the motor is connected to a corresponding electrode of the battery through only a conductive member. One of the electrode terminals of the motor may be connected to a corresponding electrode of the battery through only a conductive member and the other of the electrode terminals of the motor may be connected to a corresponding electrode of the battery directly. For example, as the battery, a button-type may be used.

[0019] According to such an attachment structure for attaching a motor to a battery, because each electrode terminal of the motor is connected to a corresponding electrode of the battery, through only a conductive member or directly, it is possible to reduce number of component parts for connection.

[0020] In the attachment structure, preferably, at least one of the conductive members can be brought into contact with or moved away from the battery or the motor. For example, as the battery, a button-type ~~one~~ may be used.

[0021] According to such an attachment structure, because the conductive members can be brought into contact with or away from the battery or the motor, it is possible to control on or off of the motor by the conductive members being brought into contact with or away from the battery or the motor.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not intended as a definition of the limits of the present invention, and wherein;

~~[0023]FIG. 1 is a perspective view showing a vehicle toy according to one embodiment of the present invention;~~

~~[0024]FIG. 2 is a plan view showing a chassis of the vehicle toy shown in FIG. 1;~~

~~[0025]FIG. 3 is a perspective view showing a motor containing part of the vehicle toy shown in FIG. 1;~~

~~[0026]FIG. 4 is a perspective view showing the motor containing part in a state of containing a motor;~~

~~[0027]FIG. 5 is a perspective view showing an example of a motor used in the vehicle toy shown in FIG. 1;~~

~~[0028]~~[0023] ~~FIG. 6 is a side view showing open and close states of a motor holding plate of the vehicle toy shown in FIG. 1;~~

~~[0029]~~[0024] FIG. ~~7~~1 is a perspective view of a motor according to an embodiment of the invention;

~~[0030]~~[0025] FIG. ~~8~~2 is an exploded perspective view of the motor shown in FIG. ~~7~~1;

~~[0031]~~[0026] FIG. ~~9~~3 is an exploded perspective view of the large case assembly shown in FIG. ~~8~~2;

~~[0032]~~[0027] FIG. ~~10~~4 is an exploded perspective view of the completed rotor shown in FIG. ~~8~~2;

~~[0033]~~[0028] FIG. ~~11~~5 is an exploded perspective view of the small case assembly shown in FIG. ~~8~~2;

~~[0034]~~[0029] FIG. ~~12~~6 is a vertical sectional view of the motor shown in FIG. ~~7~~1;

~~[0035]~~[0030] FIG. ~~13~~7 is a rear view of the rotor shown in FIG. ~~7~~1;

~~[0036]~~[0031] FIG. ~~14~~8 is an explanation view of an attachment structure for attaching a motor to a battery, according to the first embodiment of the invention;

~~[0037]~~[0032] FIG. ~~15~~9 is an explanation view of an attachment structure for attaching a motor to a battery, according to the second embodiment of the invention;

~~[0038]~~[0033] FIG. ~~16~~10 is an explanation view of an attachment structure for attaching a motor to a battery, according to the third embodiment of the invention;

~~[0039]~~[0034] FIG. ~~17~~11 is an explanation view of an attachment structure for attaching a motor to a battery, according to the fourth embodiment of the invention;

~~[0040]~~[0035] FIG. ~~18~~12 is an explanation view of an attachment structure for attaching a motor to a battery, according to the fifth embodiment of the invention; and

~~[0041]~~[0036] FIG. ~~19~~13 is an explanation view of an attachment structure for attaching a motor to a battery, according to the six embodiment of the invention.

DESCRIPTION OF THE EMBODIMENTS

~~[0042]FIG. 1 is a perspective view of a racing vehicle (racing car) toy. A housing of the vehicle toy 1 includes a chassis (base body) 2 and a body 3 which are shown in FIGS. 1 and 2. The chassis 2 and the body 3 are formed out of plastic or the like. A front portion and side portions, of the body 3 have some elasticity. The chassis 2 and the body 3 are not limited to the following structures and the like. A recess portion or a hole portion (engaging portion) is provided on an inner side of the front portion and each inner side of the side portions. The body 3 is fixed to the chassis 2 by elastically engaging a projection portion 2a of the chassis 2 with the recess portion or the hole portion. The vehicle toy 1 comprises an antenna (not shown in the figure) for receiving a control signal outputted from a controller which is not shown in the figure.~~

~~[0043]FIG. 2 is a plan view showing the chassis 2. A chargeable battery (for example, Ni-Cd battery) 4 is set to a central portion of the chassis 2 longitudinally (so as to direct it to a~~

~~running direction of the vehicle toy). The battery is not limited to this. The battery 4 is attached to a battery containing part by an attachment member 5. The attachment member 5 is formed out of plastic or the like and is an inverted U shape so as to hold a body part of the battery 4 from the upside. Both free end portions of the attachment member 5 have some elasticity and can be deformed in two directions of coming close to and going away from each other. Each engaging pawl (engaging portion) 5a and 5a is provided on the outer side of each free end portion. The battery 4 is fixed by engaging the engaging pawls 5a and 5a with each edge (engaging portion) of two hole portions 2d of the chassis 2. Two conductive pieces 6a and 6b which can be electrically connected to the positive electrode and the negative electrode, of the battery 4 are provided on the front side and the rear side of the battery containing part. The conductive pieces 6a and 6b are partially exposed to a lower surface side of the chassis 2. The exposed portions are not shown in the figure. The battery 4 can be charged by using the conductive pieces 6a and 6b which are partially exposed.~~

~~[0044]A motor containing part 7 is provided on a rear portion of the chassis 2 as shown in FIG. 3. As shown in FIG. 4, a motor 8 is set to the motor containing part 7 in a state of arranging it transversally (so as to direct it to a horizontal direction which is normal to the running direction of the vehicle toy). The motor 8 is a DC motor. As shown in FIG. 5, a conductive piece 8a is projected from a tail portion of the motor 8. The conductive piece 8a constitutes a negative terminal and is electrically connected to the negative electrode of the battery 4. On the other hand, a body part 8b of the motor 8 constitutes a positive terminal and is electrically connected to the positive electrode of the battery 4.~~

~~[0045]Hereinafter, the motor containing part 7 will be explained. The motor containing part is not limited to the following structure. As shown in FIG. 3, one edge of the conductive piece 6a which is electrically connected to the negative electrode of the battery 4, is extended to a right side wall of the motor containing part 7. On the other hand, one edge of the conductive piece 6b which is electrically connected to the positive electrode of the battery 4, is extended to the bottom of the motor containing part 7. When the motor 8 is set to the motor containing part 7 as shown in FIG. 4, the negative terminal 8a projecting from the tail portion of the motor 8 is electrically connected to the conductive piece 6a automatically. Further, the positive terminal 8b provided on the body part of the motor 8 is electrically connected to the conductive piece 6b automatically. A gear 8c is fixed to a motor shaft of the motor 8 so as to transmit the rotation of the motor 8 to the gear 8c.~~

~~[0046]A gear 7a and a gear 7b are set near the left side wall of the motor containing part 7 as shown in FIGS. 2 to 4. These gears 7a and 7b are unitedly formed out of plastic or the like, and are constructed so as to idle themselves around a transversal shaft (rotational shaft) 9. The gear 7b is engaged with a gear 7c which is fixedly provided on a rear wheel shaft 2h for the rear wheels 2b and 2b. As a result, the rear wheels 2b and 2b are rotated by transmitting the power of the motor from the gear 7a to the gears 7b and 7c in order.~~

~~[0047]Further, a motor holding plate 10 is provided on the rear portion of the chassis 2 as shown in FIGS. 2 to 4. The motor holding plate 10 is not limited to the following structure. The motor holding plate 10 is formed out of copper or the like. A plurality of slits or holes is suitably provided in order to satisfy both the improvement on the radiation of the motor 8 and the effect of holding the motor 8. The motor holding plate 10 is constructed so as to be rotatable around the transversal shaft 9 extending in a transverse direction on the front side of the motor containing part 7. The motor holding plate 10 is constructed so as to take an open position (A shown in FIG. 6) in which the motor containing part 7 is opened, and a close position (B shown in FIG. 6) in which the motor containing part 7 is closed, by rotating it around the transversal shaft 9. The motor holding plate 10 is constructed so as to hold the body part 8b of the motor 8 set to the motor containing part 7 when the motor holding plate 10 is in the close position.~~

~~[0048]~~[0037] ~~A middle portion of the motor holding plate 10 in a width direction, is curved. An end of the curved portion constitutes an engaging portion 10a. The curved portion has some elasticity. When the motor holding plate 10 is moved from the open position (A shown in FIG. 6) to the close position (B shown in FIG. 6) by rotating it around the transversal shaft 9, the curved portion is inserted into a hole portion 11 provided on a rear side of the motor containing part 7 of the chassis 2. The engaging portion 10a is engageable with an edge (engaging portion) 11a of the hole portion 11 by using the elasticity of the motor holding plate 10.~~

~~[0049]~~[0038] FIG. ~~7~~1 is a perspective view of a motor according to an embodiment of the invention, FIG. ~~12~~6 is a vertical sectional view of the motor, and FIG. ~~13~~7 is a rear view of the rotor shown in FIG. 7.

~~[0050]~~[0039] The motor ~~8~~1 is a DC motor and comprises a large case assembly ~~20~~2, a completed rotor ~~30~~3, and a small case assembly ~~40~~4, as shown in FIG. ~~8~~2. Next, the large case assembly ~~20~~2, a completed rotor ~~30~~3, and a small case assembly ~~40~~4 will be explained in order, as follows.

~~[0051]~~[0040] The large case assembly ~~20~~2 comprises a cylindrical large case body ~~20a~~20 with an opening ~~20b~~20a which is formed at the rear side thereof, as shown in FIG. ~~9~~3. The large case body ~~20a~~20 is made of a conductive material.

~~[0052]~~[0041] In the large case body ~~20a~~20, a cylindrical magnetic stator 21 is provided. The stator 21 is generally made of a permanent magnet or an electro-magnet, to produce a constant magnetic field in the motor ~~8~~1. In the embodiment, a permanent magnet is used as the stator 21.

~~[0053]~~[0042] The completed rotor ~~30~~3 comprises a core 31 attached to a rotary shaft ~~30a~~30, a driving coil 32 wound around the core 31, a sleeve 33 and a thrust ring 34 which are disposed in an end side on the rotary shaft ~~30a~~30 for sandwiching the core 31, and a commutator 35 and oil cutter 36 which are disposed in the other end side on the rotary shaft ~~30a~~30, as shown in FIG. ~~10~~4. The commutator 35 comprises a central member 35a and commutator pieces 35b, 35b and 35b which are attached to the central member 35a.

~~[0054]~~[0043] The small case assembly ~~40~~4 comprises a small case body ~~40a~~40 which is fitted into the opening ~~20b~~20a of the large case body ~~20a~~20 to close the large case body ~~20a~~20, as shown in FIGS. ~~8~~2 and ~~12~~6. The small case body ~~40a~~40 is made of an insulating material.

~~[0055]~~[0044] The small case assembly ~~40~~4 further comprises a first conductive piece 41, a second conductive piece 42, a third conductive piece 43, a first contact spring 44, and a second contact spring 45, which are attached to the small case body ~~40a~~40, as shown in FIG. 5. An end of the first conductive piece 41 is connected to the positive electrode of the battery B to form a positive lead terminal. The other end of the first conductive piece 41 has a structure to be able to electrically connect to the commutator 35 through the first contact spring 44. The top end of the first conductive piece 41 is bent after the first conductive piece 41 was assembled to the small case body 40, as shown in FIG. ~~12~~6. The second conductive piece 42 is connected to the large case body 20 through the third conductive piece 43. The large case body 20 is electrically connected to the negative electrode of the battery B. That is, the motor ~~8~~1 has a structure of an earthed body. The second conductive piece 42 has a structure to be able to electrically connect to the commutator 35 through the second contact spring 44.

~~[0056]~~[0045] Recess portions ~~46~~5 for positioning are formed at predetermined positions in the rear portion of the large case body ~~20a~~20 and in the small case body ~~40a~~40, of the motor ~~8~~1. Positioning of the rotor ~~30~~3 to the case assemblies can be carried out by fitting bosses, which are provided at predetermined positions on an attachment portion of the rotor ~~30~~3 but are not shown in the figures.

~~[0057]~~[0046] Next, embodiments of the attachment structure for attaching the motor ~~8~~1 to the battery B, according to the invention will be explained as follows.

~~[0058]~~[0047] The first embodiment of the attachment structure for attaching the motor ~~8~~1 to ~~a~~the button type battery B, is shown in FIG. ~~14~~8. In this embodiment, the motor ~~8~~1 is electrically connected to the button type battery B with the end surface of the negative electrode of the battery B faces the peripheral surface of the large case body ~~20a~~20 of the motor 1, through a conductive member 50. An end surface of the conductive member 50 to be connected with the negative electrode of the battery B is flat so as to increase the contact area with the negative electrode surface of the battery B. The other end surface of the conductive member 50 has a U-shaped or arch-shaped section to fit to the curvature of the peripheral surface of the large case body ~~20a~~20 of the motor 1 so as to increase the contact area with the large case body ~~20a~~20. On the other hand, the positive electrode surface of the battery B is electrically connected to the positive terminal (the first conductive piece) 41 of the motor ~~8~~1 through a conductive member 51 which has an L-shape as a whole and both end portions bent and folded.

~~[0059]~~[0048] The second embodiment of the attachment structure for attaching the motor ~~8~~1 to the button type battery B is shown in FIG. ~~15~~9. This embodiment is different from the first embodiment of FIG. ~~14~~8 in that the negative electrode surface of the battery B is electrically connected to the peripheral surface of the large case body ~~20a~~20 of the motor ~~8~~1 directly without the conductive member 50 which is used in the attachment structure shown in FIG. ~~14~~8.

~~[0060]~~[0049] The third embodiment of the attachment structure for attaching the motor ~~8~~1 to the button type battery B is shown in FIG. ~~16~~10. In this embodiment, the motor ~~8~~1 and the button type battery B are arranged so that the central axis of the button type battery B is approximately parallel to the rotary shaft ~~30a~~30 of the motor ~~8~~1. The end surface of the negative electrode of the battery B is connected to the peripheral surface of the large case body ~~20a~~20 of the motor ~~8~~1 through a conductive member 52. An end of the conductive member 52 is bent and folded to connect to the end surface of the negative electrode of the battery B and the other end of the conductive member 52 has a U-shaped or arch-shaped surface to fit to the curvature of the peripheral surface of the large case body ~~20a~~20 of the motor ~~8~~1 so as to increase the contact area with the large case body ~~20a~~20. On the other hand, the positive electrode surface of the battery B is electrically connected to the positive terminal (the first conductive piece) 41 of the motor ~~8~~1 through a conductive member 53 both end portions of which are bent and folded.

~~[0061]~~[0050] The fourth embodiment of the attachment structure for attaching the motor ~~8~~1 to the button type battery B is shown in FIG. ~~17~~11. In this embodiment, the motor ~~8~~1 and the button type battery B are attached so that the central axis of the button type battery B is approximately perpendicular to the rotary shaft ~~30a~~30 of the motor ~~8~~1. The end surface of the negative electrode of the battery B is connected to the peripheral surface of the large case body ~~20a~~20 of the motor ~~8~~1 through a conductive member 54. An end of the conductive member 54 is bent and folded to connect to the end surface of the negative electrode of the battery B and the other end of the conductive member 54 has a U-shaped or arch-shaped surface to fit to the curvature of the peripheral surface of the large case body ~~20a~~20 of the motor ~~8~~1 so as to increase the contact area with the large case body ~~20a~~20. On the other hand, the positive electrode surface of the battery B is electrically connected to the positive terminal (the first conductive piece) 41 of the motor ~~8~~1 through a conductive member 55 both end portions of which are bent and folded.

~~[0062]~~[0051] The fifth embodiment of the attachment structure for attaching the motor 8 to the button type battery B is shown in FIG. ~~18~~12. In this embodiment, the motor 8 is attached to the button type battery B, with the end surface of the negative electrode of the battery B faces the peripheral surface of the large case body ~~20a~~20 of the motor ~~8~~1, through a conductive member 56. The end surface of the negative electrode of the battery B is connected to the peripheral surface of the large case body ~~20a~~20 of the motor ~~8~~1 through the conductive member 56. An end of the conductive member 56 is bent and folded to connect to the end surface of the negative electrode of the battery B and the other end of the conductive member 56 has a U-shaped or arch-shaped surface to fit to the curvature of the peripheral surface of the large case body ~~20a~~20 of the motor ~~8~~1 so as to increase the contact area with the large case body ~~20a~~20. On the other hand, the positive electrode surface of the battery B is electrically connected to the positive terminal (the first conductive piece) 41 of the motor ~~8~~1 through a conductive member 57 which has an L-shape as a whole. The reference numeral 58 denotes a motor clamp for clamping the motor.

~~[0063]~~[0052] The sixth embodiment of the attachment structure for attaching the motor ~~8~~1 to the button type battery B is shown in FIG. ~~19~~13. This embodiment is almost the same as the fifth embodiment of FIG. ~~18~~12 except the point that the negative electrode surface of the battery B is electrically connected to the upper peripheral surface of the large case body 20 of the motor ~~8~~1 directly. According to the attachment structure, because the motor ~~8~~1 can be clamped by a conductive member 56, a specific motor clamp is not required.

~~[0064]~~[0053] According to the attachment structure of each of the above-described embodiments, because the button type battery B is electrically connected to the motor ~~8~~1, through a conductive member or directly, it is possible to cut off the electrical connection by moving any one of the button type battery, motor, and the conductive member.

~~[0065]~~[0054] It should also be understood that the present invention is not limited to the embodiments as above described and various changes and modifications may be made to the invention without departing from the gist thereof.

~~[0066]~~[0055] For example, although the large case body ~~20a~~20 makes a negative lead terminal in the above-described embodiments, the large case body ~~20a~~20 may make a positive lead terminal. Two electrically separated regions formed on the large case body ~~20a~~20 can be also adopted as positive and negative lead terminals. An exposed portion of an inner case which is provided in the large case body ~~20a~~20 can be also adopted as a lead terminal. Although the large case body ~~20a~~20 is used as a lead terminal in the above-described embodiments, it is possible to use the periphery of the small case body ~~40a~~40 as the terminal instead of the large case body ~~20a~~20.

~~[0067]~~[0056] The above-described motor can be incorporated in a small-sized vehicle model, a small-sized mascot doll, a key chain, a strap for cellular phone, a small-sized object such as an insect model and the like.

~~[0068]~~[0057] The entire disclosure of Japanese Patent Application No. Tokugan hei-11-368199 filed on December 24, 1999 including specification, claims, drawings and summary are incorporated herein by reference in its entirety.

~~[0069]~~[0058] According to the motor of the present invention, because in the motor with a plurality of electrode terminals, at least a peripheral portion of a case for the motor forms at least one of the plurality of electrode terminals, the motor is suitable for miniaturizing, and it is easy to electrically connect one end of each corresponding conductive lead to the corresponding electrode terminal and it is possible to enhance the rigidity of the electrode terminals. Further, it is easy to incorporate the motor into a toy and the like, and is also easy to remove it. Further, it is possible to cut off the electrical connection to the battery easily by moving any one of the button type battery, motor, and the conductive member.